Journal of Orthopedics Research and Rehabilitation

Original Article

DOI: 10.51271/JORR-0039

Percutaneous repair of achilles tendon ruptures: short-term results of 41 patients

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Received: 02/10/2024 • Accepted: 16/10/2024 • Published: 31/10/2024

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ABSTRACT

Aims: Despite the current popularity of surgical treatment of Achilles tendon ruptures, there is no clear consensus about which technique should be applied. The aim of this study is to evaluate the short- to mid-term results of acute achilles tendon ruptures treated with the percutaneous method and to discuss these results in light of the literature.

Methods: In this study, 41 patients who were operated on percutaneously with the diagnosis of acute Achilles tendon rupture between 2016 and 2019, whose treatment was completed, and who had a follow-up period of at least 1 year were included. At the patients' final follow-up visits, the range of motion of the ankle joint, time to return to work and sports, and complications were evaluated. For functional evaluations, the scoring system of the American Orthopaedic Foot & Ankle Society (AOFAS) for the ankle joint was used.

Results: The mean age of the patients was 29.3 (18-50) years and the mean follow-up duration was 23 (12-38) months. The mean dorsiflexion angle was 32.27° (20-45°) and the mean plantar flexion angle was 34.58° (20-45°). The time to return to work was 14.2 (8-21) weeks, while time to return to sports was 30.4 (17-49) weeks. The mean AOFAS score of the patients was 91.63 (74-100). The complications included infection in 2 (4.8%) patients, wound necrosis in 1 (2.4%) patient, re-rupture in 1 (2.4%) patient, and sural nerve neuropraxia in 1 (2.4%) patient.

Conclusion: The findings of this study suggest that percutaneous repair is an effective method in the treatment of acute Achilles tendon ruptures, like other surgical methods that offer good functional results with low complication rates.

Keywords: Achilles tendon, tendon rupture, percutaneous repair

INTRODUCTION

The achilles tendon is the primary plantar flexor of the ankle and is considered the strongest tendon in the entire body.[1] Acute achilles tendon rupture (ATR) is a common injury that can cause severe functional impairments.[2] Although there is still no consensus on the best method for treating ATR, surgical treatment is recently favoured in the literature. Surgical treatment of ATR has been advocated due to advantages such as early functional recovery with restoration of the continuity of the ruptured tendon, regaining its normal tension. It has been reported that surgical treatment can reduce the risk of re-rupture compared to conservative treatment, but it also increases the risk of skin and soft tissue problems.[3] Many surgical techniques have been developed to reduce soft tissue complications, provide stronger biomechanical fixation with early recovery, and shorten the time from injury to normal activity.[4-7] Percutaneous suturing, first described by Ma and Griffith,[8] combines the advantages of conservative and surgical treatment options by allowing the use of functional postoperative care.[8-17] However, percutaneous repair has been criticised for providing only 50% of the initial strength of open repair, having a higher risk of sural nerve injury (13% to 60%) compared to open surgery, and having a high rate of re-rupture (2.6% to 16.7%).[3,6,9,13,17-20] The aim of this study was to evaluate the short-term results of patients with acute ATR who underwent percutaneous repair and to discuss those results in light of the literature.

METHODS

Before starting the study, approval and informed consent were obtained from the Ankara Bilkent City Hospital Ethics Committee (Date: 25.09.2024, Decision No: TABED 1-24-602). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. This study retrospectively evaluated 47 patients diagnosed with acute ATR between 2016 and 2019, who were treated with the percutaneous method, completed their treatment, and had at least 1 year of follow-up. All

Cite this article: Bozkurt İ. Percutaneous repair of achilles tendon ruptures: short-term results of 41 patients. *J Orthop Res Rehabil.* 2024;2(4):75-78.

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surgeries were performed by the same surgeon. Patients aged 18-50 years who presented within the first 2 weeks after trauma were included in the study. Patients with open ATR, avulsion fractures, fractures around the ankle, neurological problems, or metabolic diseases affecting the tendon structure were excluded. A total of 41 patients who satisfied these criteria were included in the study. The diagnosis of rupture was made based on a positive Thompson test, palpation of a gap on the Achilles tendon, and tenderness of the achilles tendon. Superficial tissue ultrasonography was performed for all patients to support the diagnosis. At the patients' final follow-up appointments, ankle joint range of motion, time to return to work and sports, and complications were evaluated. For functional evaluation, the scoring system of the American Orthopaedic Foot & Ankle Society (AOFAS) for the ankle joint was used.

Surgical Technique

All surgeries were performed without a tourniquet in the prone position under spinal anaesthesia. All patients were given 1 g of cefazolin prophylaxis 30 min before surgery. Four small incisions were made proximal and distal to the tendon rupture site. The subcutaneous tissue was freed with the help of a clamp. A straight needle and polydioxanone (PDS) suture were passed percutaneously across the proximal end of the tendon from the proximal incisions, and the same procedure was applied for the distal end using a different PDS suture (Figure). The sutures on both ends were brought together at the same incision site and tied with the foot in plantar flexion. The incisions were closed with 3-0 polypropylene sutures and a short-leg cast was applied in 30° plantar flexion. The same rehabilitation protocol was applied for all patients postoperatively. After 2 weeks of short-leg casting, an adjustable ankle orthosis was applied. The dorsiflexion range was gradually increased by 10° each week. After 8 weeks, joint movements were allowed and ankle-strengthening exercises were started.

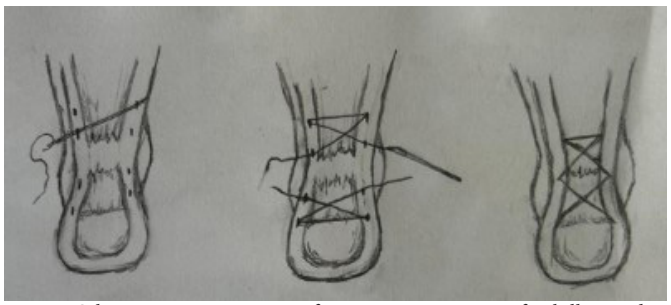

Figure. Schematic representation of percutaneous repair of achilles tendon ruptures

RESULTS

The mean age of the patients was 29.3 (18-50) years and the mean follow-up duration was 23 (12-38) months. The demographic data of the patients are summarised in Table 1. Considering injury mechanisms, sports injuries were most common, accounting for 32 cases (78%). The mean dorsiflexion angle of the patients was 32.27° (20-45°) and the mean plantar flexion angle was 34.58° (20-45°). The mean time to return to work was 14.2 (8-21) weeks and the mean return to sports was 30.4 (17-49) weeks. The mean AOFAS score of the patients was 91.63 (74-100) (Table 2). Complications included wound infection in 2 patients (4.8%), wound necrosis in 1 patient (2.4%), re-rupture in 1 patient (2.4%), and sural nerve neuropraxia in 1 patient (2.4%). Wound infections were treated with antibiotics and debridement. Wound necrosis was treated with debridement and primary repair. The patient with a re-rupture underwent revision surgery using the turndown flap technique.

Table 1. Demographic data	
Age (years)	29.3 (18-50)
Follow-up period (months)	23 (12-38)
Mechanism of injury	
Sports injury	32 (78%)
Work accident	7 (17%)
Traffic accident	2 (4.8%)
Side	
Right	21 (51.2%)
Left	20 (58.8%)
Sex	
Male	36 (87.8%)
Female	5 (12.2%)

Table 2. Evaluation of functional status and complications	
Dorsiflexion angle	32.27° (20-45°)
Plantar flexion angle	34.58° (20-45°)
Return to work (weeks)	14.2 (8-21)
Return to sports (weeks)	30.4 (17-49)
AOFAS score	91.63 (74-100)
Complications	5 (12.2%)
Wound infection	2 (4.8%)
Wound necrosis	1 (2.4%)
Re-rupture	1 (2.4%)
Sural nerve neuropraxia	1 (2.4%)
AOFAS: American Orthopaedic Foot & Ankle Society	

DISCUSSION

The treatment of ATR is still debated in the literature.[21,22] When surgical repair is chosen, open or percutaneous techniques can be used. The open technique allows the evaluation of the ruptured tendon, approximation of the torn parts, and application of augmentative procedures to the tear site, but it is prone to complications such as wound necrosis and deep infections.[3,23] To avoid these complications, various percutaneous techniques have been described. For our patients diagnosed with acute ATR, we apply the percutaneous repair technique. In the present study, 41 such patients were evaluated and complications were observed in 5 patients (12.2%). In a study by Akpınar et al.,[24] the complication rate for percutaneous repair was found to be 10%. Rouvillain et al.[25] reported 2 re-ruptures and 1 infection as complications among 60 patients who underwent percutaneous repair for ruptures of the achilles tendon. Thus, the complication rate observed in the present study was similar to previously reported findings. In a study by Ververidis et al.,[26] a re-rupture rate of 2.6% and deep vein thrombosis rate of 0.6% were found in patients who underwent

percutaneous repair for ATR, while Cretnik et al.[27] and Lim et al.,[6] in comparative studies of open and percutaneous surgical treatments, reported re-rupture rates of 3.7% and 3%, respectively, for percutaneous procedures. In this study, the re-rupture rate was 2.4%, consistent with the literature. One of the disadvantages of percutaneous repair of ruptured achilles tendons is the frequent occurrence of sural nerve injury. In a meta-analysis by Yang et al.[28] that incorporated 12 studies, the risk of sural nerve injury was reported to be higher for percutaneous surgery, but this value was not statistically significant. Klein et al.[19] reported a sural nerve injury rate of 13% with the percutaneous surgical technique. Rozis et al.[29] reported a sural nerve injury rate of 7.3% with percutaneous surgery. In the present study, sural nerve injury was detected in only 1 patient (2.4%). Another common complication in the surgical treatment of ATR is wound infection. Inglis et al. observed deep infections in 2 of the 44 patients (4.5%) they treated surgically.[30] Makulavičius et al.[31] reported a wound infection rate of 2.3%. In the present study, the wound infection rate was 4.8%, similar to the literature.

Limitations

The retrospective nature of this study is one of its limitations. The absence of a control group is another limitation, although the specific aim of this study was to evaluate and compare percutaneous repairs with the results of percutaneous repair in the literature rather than with a control group.

CONCLUSION

This study has presented an evaluation of the effectiveness and safety of percutaneous repair for ATR. Percutaneous repair yielded high functional scores and low complication rates consistent with the literature. These findings suggest that percutaneous repair is an effective method for the treatment of ATR, offering low complication rates and good functional outcomes, similar to other surgical methods.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Ankara Bilkent City Hospital Ethics Committee (Date: 25.09.2024, Decision No: TABED 1-24-602).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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